The common Parasite of the Powdery Mildews

By David Griffiths

(Plate 358)

Ampelomyces quisqualis Ces. Bot. Zeitung **10**: 301. 1852.

Cicinobolus florentinus Ehr. Bot. Zeitung **11**: 16. 1853.

Bassocystis textilis Riess. Bot. Zeitung **11**: 236. 1853.

Cicinobolus cesatii DeBary, Morph. und Phys. der Pilze, **3**: 53–75. *pl. 6, 7.*

Cicinobolus oidii Tuck. Rabenhorst, Fungi Europaei, No. 2215.

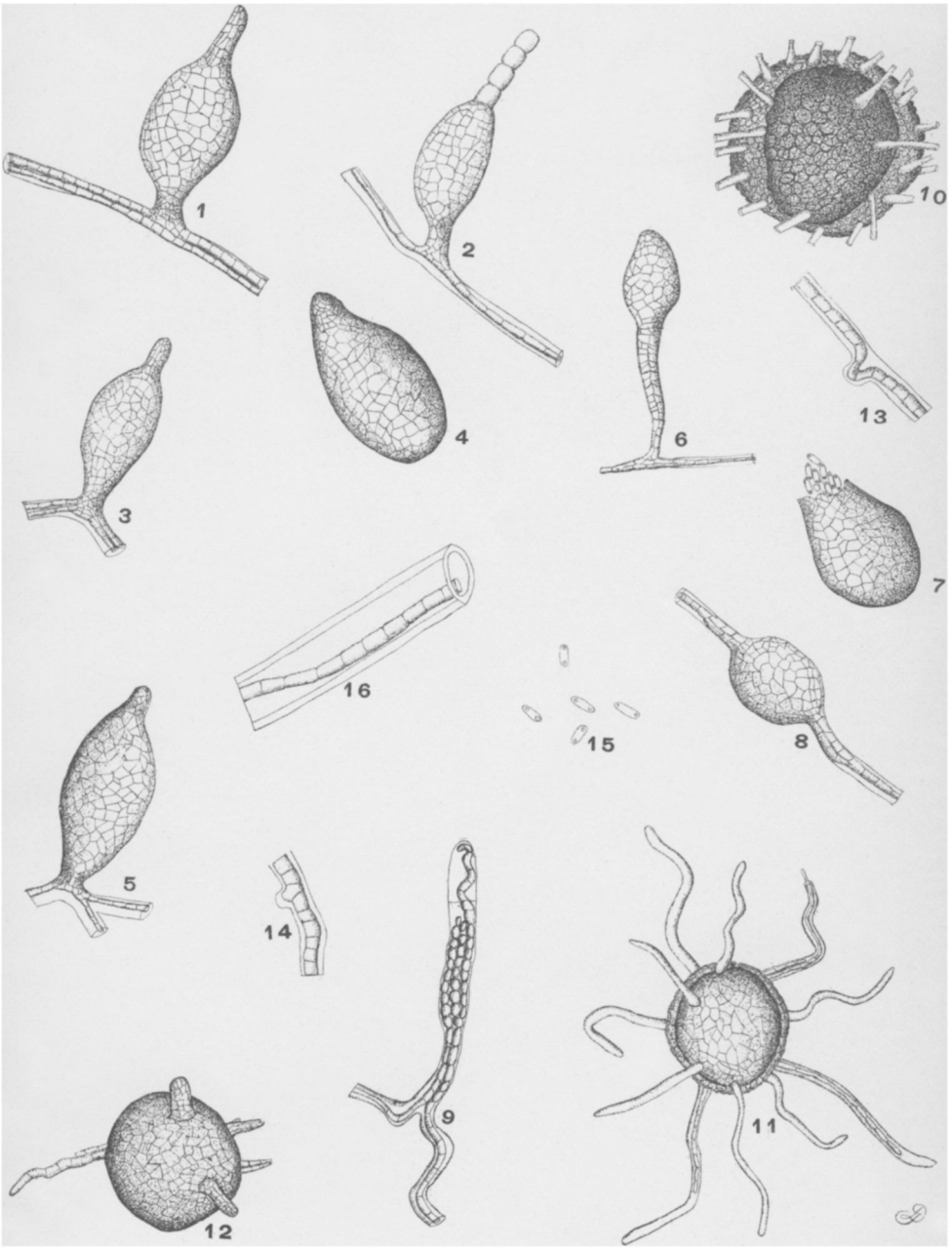
Cicinobolus humuli Faut. Revue Mycol. **12**: 37. 1890.

Cicinobolus cotoneus Pass. Thuemen Mycotheca Universalis, **17**: No. 1668.

Cicinobolus uncinulae Faut. Roumeguere Fungi Selecti Galliae **43**: No. 6208.

Cicinobolus major Kell & Swingle, Herb. J. B. Ellis, **37**: No. 84.

This plant attracted my attention a number of years ago on account of its abundance; a subsequent study of it in the field and laboratory has revealed some interesting facts. Its abundance on the forms of *Erysiphe cichoracearum* growing on *Grindelia squarrosa* in the Northwest is very noticeable. My first collection of it at Aberdeen, South Dakota, was made in 1893, but on account of the entire absence of fruit in the host (*Erysiphe*), I was unable to make any specific determinations. Although a careful search for fruiting specimens was made in the same locality for the next five years none were found. The conidial stage occurred in abundance and it was almost invariably accompanied by the *Ampelomyces*. While in company with Mr. L. W. Carter in western South Dakota and northeastern Wyoming in 1897, I collected fine fruiting specimens of the *Erysiphe* at the "L. A. K." ranch in South Dakota and at Moorcroft, Wyoming. The former was unaffected by the fungus, while the latter had practically no perithecia in a healthy condition. The latter was as fine an illustration of parasitism as one could wish to see. There was at least one-half acre of the *Grindelia* on a small creek bottom growing as thick as it could well stand, and it would have been difficult to find any leaves in the whole patch



AMPELOMYCES QUISQUALIS Ces.

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that were unaffected with the *Erysiphe*; but none of it was able to produce mature perithecia on account of the depredations of its parasite. It would be interesting to know whether the conidial stage of the *Erysiphe* carries the plant over the winter season or whether the *Grindelia* becomes inoculated by the same species growing on other composites in the same locality. It is also interesting to compare this case with the propagation of the conidial stage of the grape mildew in European countries year after year without the intervention of the perithecial stage.

While in company with Mr. T. A. Williams in Wyoming and Montana in 1898, an abundance of this plant was found on *Grindelia squarrosa* and *Lygodesmia juncea*, especially in the vicinity of Buffalo, Wyoming, and Billings, Montana. The specimens collected at old Fort McKinney in Wyoming show the habits of the parasite the best of any which I have. The *Erysiphe* on the lower leaves is practically destroyed but that on the upper younger leaves produces perithecia in abundance. The *Ampelomyces* is easily recognized by its dusty appearance which gradually grades off into the characteristic white appearance of the mycelium of the host. In this intermediate region the pycnidia may be found in abundance which develop within the perithecia, and which consequently have a globular appearance. On the lower leaves the pycnidia are usually of the oval or pyriform type. This is easily accounted for from the fact that the *Ampelomyces* produced its pycnidia on the lower leaves at a time when there were no perithecia formed and did not spread as rapidly as the host. The same holds true in general of specimens collected near Buffalo, Wyoming, on *Lygodesmia juncea*, excepting that the areas affected by *Ampelomyces* are more localized and scattered.

Besides the synonymy given above two other species of this genus have been described, *i. e.*, *Cicinobolus plantaginis* Oud. and *C. parasiticus* (Cocc.) Sacc., specimens of which have not been seen and concerning which, consequently, no positive statements can be made. So far as the descriptions in Sylloge Fungorum are concerned, however, there is nothing to prevent both of these species being placed here.

Having included some characteristics of this species which, so far I am aware, have not been noted before, it may not be out of

place to include the following description based on specimens from both Europe and America.

Mycelium variable, hyaline to fuscous, within the mycelium of species of Erysiphaceae and occasionally in the tissues of the host plant (Fig. 16), 4 to 8 (usually 4 to 5) μ in diameter; pycnidia very variable in size and form, membranous, oval, pyriform to globular, fuscous to brown, produced in horizontal mycelium (Fig. 8), conidophore (Fig. 1–7), or perithecium (Fig. 10–12); spores hyaline, oblong, often slightly inequilateral, biguttulate when mature, $6\frac{1}{2}$–$10\frac{1}{2} \times 3\frac{1}{2}$–$6$ μ (Fig. 15).

There occurs in the various descriptions of this species, under different names, a wide variation in characteristics which in many groups would establish good species, and indeed might here were it not for the extreme variability of single specimens. In some cases the pycnidia have been described oval to pyriform and stipitate, and in other cases globular. The accompanying figures will clear away all doubt regarding the possibility of such a variation and explain how it occurs. In my specimens on *Grindelia* a variation of fifty μ in size of the perithecia may often be found in the same microscopic field. A great discrepancy also occurs in the measurement of spores by various observers; when, however, the specimens from which these measurements were made are compared with one micrometer scale they are reduced to the limits easily attained in any species. Descriptions vary also in the matter of guttulation of the spores, some being described as guttulate and others as continuous. My specimens on *Grindelia* and *Lygodesmia* show both of these conditions in different stages of development. When mature the spores always show the characteristic guttulae. One may, by squeezing young pycnidia under the cover slip, see small, oval, globular or irregular continuous cells. A study of De Bary's figures of the spore development will easily show that these are nothing more than the young spores imperfectly formed, or in some cases simply cells of the pycnidia. In examining some of the herbarium material at hand, especially European exsiccati, this phenomenon was often met with. Careful examination of my own material collected early in the season showed the same peculiarity; and in some exsiccati, notably *Cicinobolus cotoneus* Pass., both mature and immature pycnidia were common.

HOSTS EXAMINED

Oidium cydoniae Pass. parasitic on *Cydoniae vulgaris* Pers.

Oidium erysiphoides Fr. (*Sphaerotheca humuli* (DC.) Burrill?) parasitic on *Humulus* sp.

Oidium Tuckeri Berk. (*Uncinula necator* (Schw.) Burrill?) parasitic on *Vitis vinifera* L.

Sphaerotheca phytoptophila K. & S. parasitic on *Celtis occidentalis* L.

Sphaerotheca Castagnei Lev. parasitic on *Bidens cernua* L.

Conidial stage of Erysiphaceae, parasitic on *Cynoglossum* sp.

Erysiphe communis (Walk.) Fr. parasitic on *Pisum sativum* L.

Erysiphe cichoracearum DC. parasitic on *Grindelia squarrosa* Dounal and *Lygodesmia juncea* Don.

Sphaerotheca Castagnei Lev. parasitic on *Collomia linearis* Nutt. and *Epilobium adenocaulon* Haus.

Phyllactinia suffulta (Reb.) Sacc. parasitic on *Crataegus rivularis* Nutt.

Microphaera alni (DC.) Wint. parasitic on *Lonicera glaucescens* Rydb.

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EXSICCATI EXAMINED

Roumeguere, Fungi Selecti Galliae, nos. 6107, 6108, 5461, 6207, 6208. Sydow. Mycotheca Marchica, no. 1537. Rabenhorst, Fungi Europae, no. 2215. Krieger, Fungi Saxon, no. 987. Thuemen. Mycotheca Universalis, no. 1668.

Explanation of Plate 358

1. Pycnidium produced in conidiophore on *Grindelia*. All remains of the conidiophore have disappeared, but the mycelium of *Ampelomyces* can be seen within the mycelium of the *Erysiphe*.

2. The same with the remains of the conidiophore.

3. Pycnidium of *C. cotoneus* Pass. (Thuemen, Mycotheca Universalis, no. 1668).

4. Pycnidium on *Grindelia*.

5. Pycnidium of *C. humulis* Faut. from duplicate of the original material (Roumeguere, Fungi Sel. Gal. no. 5461).

6. Pycnidium evidently developed in the upper part of a conidiophore on *Lygodesmia juncea*.

7. Pycnidium of *C. uncinulae* Faut. from duplicate of the original material (Roumeguere, Fungi Sel. Gal. no. 6208).

8. Pycnidium developed within the horizontal mycelium threads on *Grindelia*.

9. Young pycnidium on *Lygodesmia juncea*.

10. Young pycnidium developing within a large perithecium on *Grindelia*.

11. Pycnidium within a smaller perithecium. The wall of the perithecium has almost disappeared. Some of the appendages contain the mycelial threads of the fungus.

12. Pycnidium developed within the perithecium, the perithecium having entirely disappeared. The appendages will be easily recognized as a development of the mycelium within the appendages as seen in 11.

13 and 14. Mycelium of *Ampelomyces* within the mycelium of *Erysiphe cichoraceaarum* on *Lygodesmia juncea*, the mycelium of the former growing into the haustoria of the latter.

15. Spores from specimen on *Grindelia*.

16. Mycelium of *Ampelomyces* within the leaf hairs of *Cydonia vulgaris* Thuemen's Myc. Univ. no. 1668).

NOTE.—All drawings magnified 270 diameters except no. 10, which is magnified 190 diameters.

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